" A STUDY OF THE IMPACT OF PROBLEM BASED LEARNING AND CONCEPT MAPPING STRATEGY IN SCIENCE ON LEARNING OUTCOMES AMONG SECONDRY SCHOOL STUDENTS".

A

SYNOPSIS

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TOPIC

A STUDY OF THE IMPACT OF PROBLEM BASED LEARNING AND CONCEPT MAPPING STRATEGY IN SCIENCE ON LEARNING OUTCOMES AMONG SECONDRY SCHOOL STUDENTS.

1.INTRODUCTION

Problem Based Learning (PBL)

learning to a stronger and valuable learning**. Howards Burrows** invented this new technique of Problem Based Learning **(PBL)** to improve the student's achievement and skills of learning. Problem-based learning (PBL) has been an integral part of medical curricula for decades.

Problem-based learning is a pedagogical approach in which students gain knowledge and acquire skills by engaging with a medical case (real-world or hypothetical) in small groups. While it is now applied in various fields, it originates from the teaching of medicine. Problem based learning has its roots in the constructivist theory of learning given by Jean Piaget (1972) and social development theory given by Vygotsky (1978). Both of the theories asserted that humans can generate knowledge by an interaction between their experiences and ideas

Barrows and Tamblyn (1980) defined the concept of PBL as the learning that results from the process of working towards the understanding or resolution of a problem. In the PBL method problem is encountered first in the learning process which serves as a focus or stimulus for the application of problem solving or reasoning skills.

Albanese and Mitchell (1993), "Problem-based learning at its most fundamental level is an instructional method characterized by the use of patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical Science.

Savery and Duffy (1995) supported the claim that PBL is a constructivist approach and agreed with the principles of constructivist instructions. Problem Based Learning (PBL) as its name implies, always begins with a contextualized, real world, ill structured and messy problem.

De Graff & Kolmos (2007), "Problem Based Learning an educational strategy is a method which organizes the learning process in such a manner in which students actively engage themselves for finding answers."

Shamsan & Syed (2009) PBL is a strategy that promotes lifelong learning and is a powerful classroom process that uses real-world problems that motivate students on identifying and applying concepts and information related to research, PBL is an effective technique which involves active learning rather than passive for students to learn, retain, integrate and apply information.

Barrows's (1996) core model of PBL describes six core Characteristics/components of PBL

Problem Based Learning (PBL)

1) Small groups (8-10)
2) Facilitator
3) Self Regulated Learning
4) Problem Solving Skills
5) Authentic Problems
6) Student centered

Concept mapping

Concept mapping According to Novak and Canas (2008), “Concept Mapping is a graphical tool for organizing and representing relationships between different concepts. The Concepts are usually represented as boxes or circles and are connected with labelled arrows, in a downward-branching hierarchical structure. The relationship between concepts is articulated in linking phrases, like, "gives rise to", "results in", "is required by," or "contributes to".”

A concept map is a diagram that shows the relationships between different ideas. This helps you understand how they’re connected. Every concept map — whether it’s simple or complex — is made up of two key elements:

Concepts: These are typically represented by circles, ovals, or boxes and are called “nodes.”

Relationships: These are represented by arrows that connect the concepts, and the arrows often include a connecting word or verb (but they don’t have to). These arrows are called “cross-links.

Olusola & Hammed (2008) maintained that concept mapping as an instructional technique can be useful in the following ways.

1. As an evaluation tool to facilitate meaningful learning.
2. As a teaching learning device by the teacher to enable student learn the meaning of concepts and their relationships.
3. As a learner centered tool which can be used to summarize articles or chapters of textbooks.

Several types of concept mapping have been configured with structures such as hierarchy, cyclic, chain, spider maps and networks. These could be used to mentally represent the knowledge embedded in one's long term memory.

- **Concept Mapping -seven steps**

- **Step One**

Identify the main topic

Brainstorm everything you know about the topic

Use relevant content from course, lectures, textbooks, and course material

- **Step Two**

Organize information into main points.

- **Step Three**

Start creating map

Begin with main points

Branch out to supporting details.

- **Step Four**

Review map and look for more connections

Use arrows, symbols, and colors to show relationships between ideas.

- **Step Five**

Include details this is where I can provide more information about each point – below, I've taken one of the points and added to it.

- **Step Six**

Analyze and improve map by asking questions

How do ideas fit together?

Have all necessary connections been madden.

- **Step Seven**

Update concept map as you learn more

Ask key questions about connections between ideas

The above mentioned framework is directly linked with the present study. The emergence of Problem based learning (PBL) and Concept mapping is clarified by five tenets. These are as follows:

1. Approach towards construction of knowledge
2. Process of Learning
3. Social support and peer collaboration
4. Learner centered learning environment
5. Incorporation of meaningful learning

LEARNING OUTCOME

Consider a course or training session in which you are in at present. Recognize one skill that accordingly would be important to inherit or do by the end of this learning while. If you do this, then you are starting to build a learning outcome.

Definition of Learning Outcomes

Learning outcomes are presentations that define important learning that learners have gained, and can reasonably illustrate when the course or program ends.

Spady, (1994), an educationalist who charged the development of outcomes based education, states that the capability to demonstrate learning is the main thing. He suggests that significant matter is important, but that matter alone is not sufficient as a result. Rather, knowledge of matter must be exhibited through a demonstration procedure.

Spady, also inscribes the performance set-up in which the performance exhibition takes place. He states a variety of performance contexts from that of exhibitions of classroom learning to those which include surviving in the larger society.

Learning outcomes refer to examinable and quantifiable

- knowledge
- abilities
- perception

2. Need and significance of the study

In the current academic era, the downfall in academic standards has become a key concern for academicians around the world. The sharp decline in student's performance, drop out and are some of the worrisome academic concerns which require immediate solutions from government and educational institutes .

According to **Kilic and Cakmak (2013)**,Science is a very difficult

subject for students especially the pioneer one but if once they build the better and right understanding of basics and fundamentals, they acquire the skill, to handle the subject very well. Some of the major reasons for this lack of understanding are :

(1) Students are rote learning (memorizing definitions and statements) instead of learning meaningfully (correlating new knowledge to previously learned).

(2) Students are unable to recognize the key concepts and concept relationships needed in order to understand the material.

(3) The key concepts or concept relationship may not be clearly presented by the instructor.

(4) Lack of connection between the concept areas.'

Therefore, if the students can be introduced to meaningful learning, they will be able to grasp the subject in a better manner. Meaningful learning requires three conditions namely conceptual clarity in the matter being taught, relevant prior knowledge of the learner and the learner's decision to learn meaningfully rather by rote memorisation.

Concept Mapping is a technique for visualizing the relationships between different concepts. They are most commonly defined as two dimensional diagrams that consist of concepts or nodes linked by labelled lines to show relationships between and among those concepts. Hence using Concept Maps to teach and study science is very beneficial.

Science is the outcome of human Behaviour to build conceptual models to understand the world. It is a dynamic, expanding body of knowledge, covering newer domains of experience every day. Sometimes, a theory may suggest a new

experiment; at other times an experiment may suggest a new theoretical model. However, for a scientific theory to be acceptable, it must be verified by relevant observations and/or experiments.

Science is being taken as one of the core subjects in the secondary school curriculum. While science is still an integrated subject at secondary stage, this is the time when the disciplines of physics, chemistry, and biology begin to emerge. A wide range of strategies and their imaginative combinations such as activities, experiments, projects, field visits, surveys, problem solving, group discussion,debates, role plays, etc.

Class 10^{th} biology builds on the concepts learned in class 9^{th} , so it's important to have a solid understanding of the topics covered in class 9 biology. Here are some of the important chapters from class 9^{th} biology that you should be familiar with for class 10^{th} .

Then researcher is feel this topic is reliable to research in the future researcher benefit and other students.

3. STATEMENT OF THE PROBLEM

"A STUDY OF THE IMPACT OF PROBLEM BASED LEARNING AND CONCEPT MAPPING STRATEGY IN SCIENCE ON LEARNING OUTCOMES AMONG SECONDRY SCHOOL STUDENTS."

4.OBJECTIVE OF THE STUDY

The study will be conducted to meet the following objectives:

1. To study the problem based learning of the secondary school students.

2. To study the concept mapping strategy of the secondary school students.

4. To study the learning outcomes of the secondary school students.
5. To study the relationship between problem based learning and concept mapping strategy of the secondary school students.
6. To study the relationship between problem based learning and learning outcomes of the secondary school students.
7. To study the relationship between concept mapping strategy and learning outcomes of the secondary school.
8. To study the relationship among problem based learning, concept mapping strategy and learning outcomes of the secondary school students.
9. To compare the group taught through experimental learning strategy and conventional learning strategy on student's concept mapping strategy .
10. To compare the group taught through experimental learning strategy and conventional learning strategy on student's learning.

11. To plan ,design and validate learning outcomes for 9^{th} and 10^{th} class in the subject of biology.

12. To develop and validate problem based learning strategy and concept mapping strategy for for 9th and 10th class in the subject of biology.

13. To the study of impact of problem based learning strategy and concept mapping strategy on learning outcomes for 9th and 10th class in the subject of biology.

5.HYPOTHESIS OF THE STUDY

The study will be design to test the following hypotheses:

H0 1: There will be no significant difference between the problem based learning and concept mapping strategy of the secondary school students.

H0 2: There will be no significant difference between the problem based learning and learning outcomes in science of the secondary school students.

H0 3: There will be no significant difference between the concept Mapping strategy and learning outcomes in science of the secondary school students.

H0 4: There will be no significant difference between in mean scores of experimental and control group .

H0 5: There will be no significant difference between in mean scores of the problem based learning and concept mapping strategy of the secondary school students.

H0 6: There will be no significant difference between in mean scores of concept mapping strategy of experimental and control group of the secondary school students.

H0 7: There will be no significant difference between in mean scores of learning outcomes in science of experimental and control group of the secondary school students.

H0 8: There will be no significant difference between in the group taught through concept mapping strategy and conventional learning strategy on student's learning outcomes .

6.OPERATIONAL DEFINITION

PROBLEM BASED LEARNING

Problem-based learning (PBL) is a student-centered teaching method where students are given the opportunity to solve open-ended real-world problems. The teacher provides limited guidance and is usually referred to as a "facilitator".

CONCEPT MAPPING

Concept mapping is a type of structured graphic display of an individual's conceptual scheme within a well-circumscribed domain.

SCIENCE ON LEARNING OUTCOMES

Learning Outcome in science means the level of success or efficiency achieved in science subject which was judged by learning outcomes test (from selected topics) of science developed by examiner.

SECONDARY SCHOOL STUDENT

Secondary school student means as 9^{th} and 10^{th} eligible educational activities in the school are called secondary school student .

7.REVIEW OF LITERATURE RESEARCHS

REVIEW OF LITERATURE RELATED TO PROBLEM BASED LEARNING

Zejnilagic-Hajric et al. (2015) presented the effects of PBL application in 8th grade primary students when learning about chemical compounds. A pretest-posttest study with control and experimental groups was desinged. Students in control group were taught in usual way with teacher centered approach, while in experimental group the PBL materials designed for the purpose of this study were applied. Results showed significant improvements of students‟ achievements in experimental group, students encountered certain difficulties as they were not used to it, overall interest and engagement in chemistry lessons has increased.

Aidoo et al. (2016) evaluated effect of problem-based learning on students‟ achievement in chemistry. 101 equivalent students were selected for the study using pre-test. The control group was taught with the traditional lecture method while the experimental group received instruction with PBL. Independent t test was used for the analysis. Results showed that there was significant difference ($p < 0.05$) in chemistry achievement of students between control and the experimental group.

A study conducted by Chiung et al. (2020) determined the impact of PBL strategy in enhancing students learning in computer programming. Results indicated that the PBL method can enhance the satisfaction, enjoyment, motivation and user interface for problem based game learning coursework.

This is evident from the above discussed studies that Problem based learning has a positive

relationship with academic achievement. PBL enhances achievement among students at various levels. PBL has long term goals. Various researches have been 57 conducted in distinct areas and under various circumstances that clearly validated the positive relationship between PBL and achievement.

REVIEW OF LITERATURE RELATED TO CONCEPT MAPPING

Prabir K. Sarker (2015) problem-solving. Objective was to know the effect of using **concept maps** as a learning method for solving problems. The study was exploratory in nature where 106 students were engaged. Initially students were inducted in a two-hour lecture with a face to face interaction for the introduction of concepts, derivation of fundamental theories for analysis of different structures. Students were further exposed to learn the numerical examples in the class, then provided with a problem-solving task working in small groups where a concept map was constructed to solve the problem. This helped the students to develop step by step solution procedure. The study shown that 73% of the student wanted to see the continued use of concept map in lectures.

Muhammad Safdar et. al (2012)CONCEPT Maps: An Instructional strategy to Facilitate Meaningful Learning and the objective of the study was to **use concept mapping** in making the concepts more meaningful to the learners. The design of the study was experimental consisting of total 98 students from 9th class. The study showed consistent and supportive results in favour of concept map as a meaningful learning tool as compared to the lecture method. Study showed a contrast between concept mapping method with that of traditional approach of teaching.

Review related to Learning Outcomes

22.Kalapriya and Anuradha (2015) examined the Emotional Intelligence and Academic Achievement among Adolescents. The sample comprised of 100 college students ranging in age between 16-17 years studying in Junior and Senior intermediate in Tirupati town. The sample consisted of 50 boys and 50 girls' adolescents. The participants were administered with Emotional Intelligence scale developed by Mangal and Mangal (2004). Chi-square test was used for analysis of the data. The results of the study indicate that there is significant difference between Emotional Intelligence and Academic Achievement among Adolescents

24. Ramesh, Samuel and Ramkumar (2016) examined the relationship between the level of Emotional Intelligence and Academic Achievement of the students by review of the studies conducted in India and worldwide with particular emphasis on the impact of emotional intelligence on the academic achievements of the students in general and college students in particular. The findings of the study revealed that positive relationship exists between emotional intelligence and academic achievement among students.

8. RESEARCH METHOLOGY

The researcher has used quantitative research for This Quasi Experimental Method with the Pretest – Posttest

Nonequivalent Groups design will be adopted for the study.

POPULATION

The population for this study is the secondary level student' s government and privet school to selected Bihar state in Darbhanga district.

❖ SAMLE FOR THE STUDY

The sample for the study comprised 300 students of Standard 9^{th} and 10^{th} studying in two schools following the State Syllabus of BSEB and CBSC in Bihar Darbhanga Distirct. They will be selected using Stratified Random Sampling Technique.

9. TOOLS USED FOR THE STUDY

In order to meet the needs and objectives of the study following tools will be adopted.

1. Lesson Plans based on Problem based learning for Standard 9^{th} and 10^{th}.

(Prepared and validated by the Guide and Investigator)

2. Lesson Plans based on concept based strategy for Standard 9^{th} and 10^{th} .

(Prepared and validated by the Guide and Investigator)

3.Test of learning outcomes for selected topics of science only form the prescribe BSEB Syllabus of class 9^{th} and 10^{th}.

(Prepared and standardized tools by the Guide and Investigator).

❖ STATISTICAL TECHNIQUE

The data so collected was statistically analyzed with the help of following statistical measures to arrive at meaningful conclusions-

Descriptive Statistics- Median, Mean, Mode, Kurtosis, Skewness. Standard Deviation, Variance, Coefficient of Correlation were used.

(ii) **Inferential Statistics**- ANOVA, ANCOVA and t- test were used.

DELIMITATIONS

In order to make study more specific and methodical it has been delimited to following points:

1. This study delimitation only Bihar state in Darbhanga district.

2.This study will be selected Government schools and private school.

3. This study will be selected 9th and 10th secondary level student.

4.This study will be pretest- posttest control group design.

5. Sample will be selected 300 hundred secondary level students only.

6.The experiment will be treatment confined to about 20 lesson plan working days of the Academic session.

7. Only Chapters 5 biology will be selected from 9^{th} class treatment.

8. Only Chapters 5 biology will be selected from 10^{th} class treatment.

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